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Climate Risk Insurance: International Experience And Policy Implications For Vietnam*

Tran Mai Trang and Tran Thi Viet Ha1
Vietnam Institute of Economics
Email: tranthivietha189@gmail.com*

Abstract: *Climate finance and risk insurance solutions are part of a comprehensive disaster risk management approach that can help grow economies and help protect lives, livelihoods, businesses, infrastructure, and public finances by strengthening disaster preparedness, rapid response, and recovery. Vietnam is facing many losses due to natural disasters and climate change. Therefore, Vietnam needs a reasonable basis to develop climate risk insurance to mitigate the negative impacts of climate change on the socioeconomic. This article will analyze the experiences of China, the Philippines, and Indonesia in climate risk insurance and its application opportunities to Vietnam through policy suggestions.*

Keywords— Insurance; climate risk; natural disaster; climate change

1. INTRODUCTION

The incidence and severity of natural disasters are increasing due to the consequences of climate change. Specifically, the frequency of weather-related disasters has increased sixfold since the 1950s, and the trend continues to rise. (CISL, 2016). Extreme weather events have left at least 3,500 people dead and more than 13.5 million homeless (Kramer, D., & Ware, J., 2020). In addition, the ten worst weather disasters in 2021 caused damage to up to $170 billion worldwide. This consequence severely affects countries, especially low-income countries, whose ability to recover is slow.

Vietnam is frequently affected by natural disasters. According to the Climate Risk Index for 2021, Vietnam ranks 13th out of the 20 countries most affected by extreme weather events in the 20 years from 2000 to 2019 worldwide (Eckstein, D. et al., 2021). In addition, the damage caused by climate change strongly impacts the Vietnamese economy. Vietnam will likely suffer up to $1.4 billion in physical damage from floods, storms, and earthquakes yearly. In addition, in the next 50 years, there is a 40% risk that Vietnam will suffer more than $6.7 billion in damage from storms, floods, or earthquakes. In a significant natural disaster, the injury sustained by Vietnam could be more than 9% of GDP. Provinces in the North Central region with higher poverty rates are more likely to face economic losses (WB, 2016).

In that context, insurance is considered one of the practical solutions to provide appropriate measures to limit risks and financial losses caused by natural disasters. Insurance has quick liquidity after a disaster and the opportunity to share risks with the community. The reality in countries and territories shows that the more developed the insurance program, the lower the pressure caused by the economy - society risks. Taiwan has disaster insurance for people's houses in the event of an earthquake. An earthquake's maximum compensation is NT$70 billion (equivalent to VND 57 trillion). Since 2007, the Central American and Caribbean Disaster Risk Insurance Scheme (CCRIF) has made 54 payments to 16 member governments totaling approximately $245 million. All prices are due within 14 days of the disaster (CCRIF, 2022). Mexico has disaster insurance for most types of natural disasters and catastrophes. The country's financial source for insurance implementation comes from the FONDEN disaster fund. This fund is responsible for providing funds for disaster relief efforts and rebuilding infrastructure after disasters.

In Vietnam, insurance-related issues are identified as one of the top priority tasks to mobilize resources for climate change adaptation (NDC, 2020). However, current insurance products do not meet the requirements due to premium rates, compensation levels, coverage, and resource limitations. Therefore, the article will study international experiences in climate risk insurance and provide some policy implications for developing climate risk insurance in Vietnam.

2. LITERATURE REVIEW

Risk is uncertainty that can be measured (Frank H. K., 1921). The risk is the potential variability of outcomes, which can occur in most human activities. When there is a risk, one cannot accurately predict the outcome. The presence of risk is uncertain. Risk arises whenever an action leads to an unpredictable possibility of gain or loss" (Arthur et al., 1998). Climate risks will include natural disasters affecting vulnerable households, businesses, and smallholder farmers affecting households, businesses, and smallholder farmers (Camargo. et al., 2019).

Climate risk insurance is one of the tools in climate risk management, this type of insurance is designed to reduce financial and other risks related to climate change, especially phenomena such as extreme weather (Smolka, 2006; Hermann et al., 2016; Ramm et al., 2018). In addition to climate risk insurance, some terms such as "disaster risk insurance," "extreme weather insurance," or "index insurance" also refer to these forms of insurance (GIZ, 2020).). Insurance provides post-disaster liquidity for relief and reconstruction measures and prepares future measures to reduce vulnerability (MICC, 2016). In addition, climate insurance is used to enhance

resilience, mitigate and transfer risks, and build greater resilience to impacts from natural hazards (Michael et al., 2020). The flooding in Germany in 2002 caused about € 9.2 billion (Munich Re 2002). The relevance of weather risks for the insurance sector becomes evident by observing past trends in insured and other economic natural catastrophe losses. Data of past natural catastrophe losses collected by Munich Re (2006) indicate that increased global trends in losses can already be observed. The main factor behind this rise in losses has been a societal change. Continued economic growth, economic development, and population growth, notably in vulnerable regions (e.g., coastal zones), combined with rapid and extreme climate change is likely to accelerate and magnify the tempo and extent of damages

Research by InsuResilience Global Partnership (2020) shows that climate finance and insurance are solutions to strengthen the resilience of developing countries and protect the lives and livelihoods of the poor and vulnerable in developing countries from the impact of natural disasters. Nguyen Huy et al. (2020) assert that climate and disaster insurance have the potential to promote proactive disaster preparedness adaptation while helping to reduce risks for businesses. In addition, countries with high insurance coverage have more developed disaster GDP than those with low insurance coverage (Melecky, M. and C. Raddatz., 2011). Although reference will be made to the effects of extreme weather on health and life insurance, the overall impact of climate change on death rates due to severe weather is expected to be limited in a developed country like the Netherlands. Globally, mortality rates due to extreme weather events have decreased considerably over the last century (IFRC 2003; Goklany 2007), which indicates that societies have been able to adapt to increased health risks caused by more extreme weather, for example, using improved medical care (Goklany 2007)

In summary, climate risk insurance has the prominent role of compensating for damage caused by natural phenomena to policyholders. It also helps bring stability to economic and association life under uncertain conditions. However, studies on climate risk insurance in Vietnam are scarce. Therefore, the author hopes this study will be a helpful reference and pave the way for future studies on climate risk insurance in Viet Nam.

3. RESULTS AND DISCUSSION

3.1 RISK INSURANCE FOR CLIMATE CHANGE IN CHINA

a. Coverage

In China, each locality has different economic conditions, geographical characteristics, and level of insurance market development, so disaster insurance policy is also different (WBa, 2020). The coverage and subject matter covered in each locality also differ. In Shenzhen, city coverage includes earthquakes over 4.5 magnitudes, windstorms, rainstorms, floods, tsunamis, landslides, mountain landslides, thunder, typhoon, inundation, tornadoes, hail, a flood of pipes carrying soil and rock, subsidence, risks of nuclear accidents caused by natural disasters; The subject matter insured is human and property. Coverage in Ningbo - Zhejiang is narrower, including typhoons, intense tropical storms, tornadoes, rainstorms, floods, and blizzards, and the insured is the property of households and people (WBa, 2020)

a. Mechanism of insurance implementation

China does not build a unified risk insurance mechanism across the country but encourages provinces and cities to make complementary insurance products based on the actual situation of each locality. Accordingly, the Government stipulates different support fees and different insureds suitable for localities. However, there is one thing in common: the insurance premium support mechanism is implemented on the basis of the principle of initiative, voluntary, market-based operation, responsibility sharing, and step-by-step implementation. The principle of "Shared responsibility" means that the Ministry of Finance, financial authorities at all levels, households, and related departments share the insurance premium. The central finance will only support premiums provided that the monetary authorities of the province, city, or household agree to contribute a part of the premium.

In addition, depending on the type of insurance, the conditions for insurance implementation and the level of compensation will differ based on the frequency and extent of damage caused by climate risks.

Table 1. Fees and compensation for risks in some regions of China

China's Catastrophe Insurance	Premiums and rates	Sum insured
Sichuan Earthquake Catastrophe Insurance	Policyholders pay 40% of the premium, and the government provides a 60% premium subsidy. 100% premium subsidy is applicable for households needing special assistance.	From 50,000 yuan for urban and 20,000 yuan for rural housing, with upper limits of 1 million yuan per household. The upper limit of an annual aggregate payment is either eight times the premium revenue or 800 million yuan. If the total yearly insurance loss exceeds the sum of the limit and insurance reserve fund, the policy callback is proportional.
Ningbo (Zhejiang) Catastrophe Insurance	Fully paid by the government. Municipal and county (district) finance cover 60%	Casualty benefits: 200,000 yuan/ person, 300 million yuan/accident.

	and 40% of the cost, respectively	Family property: 3,000 yuan/ household, 300 million yuan/ accident. Public event relocation: 13,500 yuan/person.
Shenzhen (Guangdong) Catastrophe Insurance	Fully paid by the Shenzhen government	Casualty benefits: 100,000 yuan/ person, 2 billion yuan/ accident. Nuclear emergency relief: 2,500 yuan/ person, 500 million yuan/accident. House loss: 20,000 yuan/household, 200 million yuan/ accident. Indemnity limits apply only to events. No annual upper limits

Resource: Wba, 2020

a. Financial sources for insurance implementation

China's climate hazard compensation system relies heavily on government bailouts and contributions from households and insurance companies. For insurance companies engaged in providing climate risk insurance to the locality but unable to pay the total compensation, the Government will consider supporting the missing part to overcome the consequences of the risk.

The Shenzhen city government spent 30 million yuan to set up a disaster insurance fund that mainly compensates for losses higher than the compensation limit of commercial insurance purchased by the government from insurance companies. The fund is open and able to attract all sources of support from businesses, individuals, and social organizations to participate in forming a long-term reserve. Ningbo City uses its premium surplus and spends an additional 10.2 million yuan annually to support its insurance reserve fund.

3.2 RISK INSURANCE FOR CLIMATE CHANGE IN THE PHILIPPINES

a. Coverage and subject matter of insurance

The Philippines has two climate risk insurance schemes:

The first is the agricultural insurance program, targeting farmers who cultivate rice and maize, high-value agricultural products such as tomatoes, potatoes, and garlic; pets; investment assets in agriculture from all risks posed by climate and natural disasters.

Second is the parametric insurance program implemented in 2017 (WB, 2017). This program aims to

(i) insure 25 provincial governments - Local Government Units (LGUs) - against emergency damage caused by significant storms;

(ii) (ii) insurance for national government agencies (NGA) against emergency damage from hurricanes and earthquakes to national government property (based on damage in 25 selected provinces). This solution enables provinces and national governments to respond more quickly and effectively to the impact of disaster events.

b. Mechanism of insurance implementation

The Philippine Crop and Livestock Insurance Service is a risk management mechanism designed to mitigate risks in agriculture and reduce the consequences of natural disasters that cause losses, especially for the most vulnerable farmers who are more resilient (Estacio and Mordeno, 2001). The agricultural insurance scheme in the Philippines has the following characteristics: (i) receiving large subsidies from the government, (ii) most public insurance services are MPCI (Multiple Peril Crop Insurance). risks) and is mandatory, (iii) there is a limitation in agricultural reinsurance to cover systemic risks (Dao Thi Thu Hang, 2016).

Insurance premiums are shared between farmers, the Government, and credit institutions (if farmers borrow funds) and are calculated on a factual basis. For borrowers, banks and credit institutions are responsible for subsidizing insurance premiums at 2% for rice and 3% for corn. The remaining fee is shared in the ratio of 40/60: farmers 40%, Government 60%. In 2013, if a hectare of rice land is damaged, compensation will be from 40,000-50,000 Pesos (equivalent to 2.2 - 2.7 million USD). The insurance of basic crops in the Philippines covers over 70 provinces, of which more than half (90,471 ha) is maize, and 2,417 ha is rice land (Oscar, 2014).

Regarding the parametric insurance scheme, the government-owned insurance agency, the Government Service Insurance System (GSIS), will provide disaster risk coverage to the national government and the 25 participating provinces. The World Bank (WB) acts as an intermediary reinsurer to transfer GSIS risks to international reinsurers such as Nephila, Swiss Re, and Munich Re (WB, 2017). Upon receipt of payment from the global reinsurer, GSIS will transfer the proceeds to the Philippine treasury (BTr) in the form of a trust receipt, and BTr is responsible for distributing the insurance payment to the LGU and the NGA through a Joint Memorandum of Understanding (JMC) (WBb, 2020).

Figure 2. Parametric insurance structure

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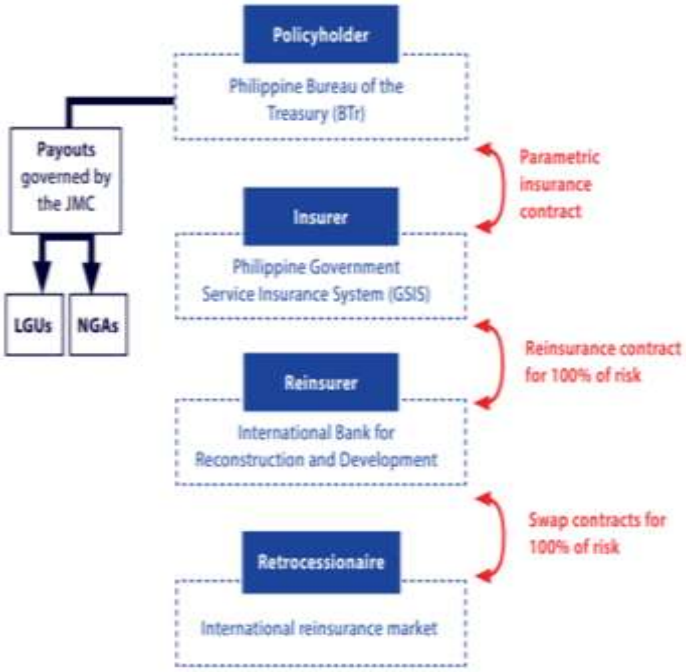

Source: WBb, 2020

After two years of piloting the parametric insurance program, the insurance coverage doubled compared to the previous year. The scope of insured and paid risks also increased compared to the first year. However, there is a slight increase in the price of insurance between the two years due to the rise in transaction fees involved (WBb, 2020).

Table 2. Catastrophe insurance policy details, policy years 1 and 2

Policy Year 1: July 2017–July 2018				
Premium	Coverage limit	Number of calculation requests submitted to and reviewed by AIR[1]	Number of payouts	Total value of payouts
1 billion peso (19.8 million USD)	10.4 billion peso (206.4 million USD)	2 typhoon	1 typhoon	83,516,981 peso (1,657,083 USD)
Policy Year 2: December 2018–December 2019				
2 billion peso (39.7 million USD)	20.5 billion pesos (406.7 million USD)	11 (2 typhoons, nine earthquakes)	One typhoon, one earthquake	1,338,715,094 peso (26,561,807 USD)

Source: WBb, 2020

a. Financial sources for insurance implementation

In the Philippines, national disaster funds (NCFs), local disaster funds (LCFs), and emergency funds established for disaster recovery are all financed from the state budget. The NCF consists of a central fund and a local fund. LCF can deduct up to 5% from annual local budget revenues to spend on disaster risk management such as training programs, procurement of rescue equipment, medicine, etc. disaster assistance, insurance premiums, etc. In addition, the Philippine government also established a disaster reserve fund managed by the Ministry of Finance, in which the State allocates 500 million pesos (more than 9 million USD).) to cover losses when the total loss exceeds the premium collected.

3.3 RISK INSURANCE FOR CLIMATE CHANGE INDONESIA

a. Coverage and subject matter of insurance

Indonesia is very vulnerable to natural disasters such as earthquakes, volcanic eruptions, and floods due to the geographical location of the Indonesian archipelago. In addition, due to the negative impacts of climate change, the associated risks are increasing. So Indonesia developed separate insurance for these types of hazards. Climate risk insurance in Indonesia, Maipark insures properties such as houses, commercial centers, factories, schools, etc., by natural disasters such as earthquakes, volcanic eruptions, fires and explosions after earthquakes, and tsunamis.

b. Mechanism of insurance implementation

Indonesia uses risk insurance through a combination of risks to disperse and mitigate risks in financial markets, creating a mechanism to share information and knowledge among institutions in disaster risk management. The variety of risks is a form of many parties participating and sharing risks with different types of insurance and reinsurance through a legal framework prescribed by the Government.

PT Maipark Private Property Disaster Insurance (or Special Catastrophe Risk Reinsurance Company) is Indonesia's only specialized earthquake insurance company. PT Maipark was established with the mission of (i) promoting the promulgation of regulations for earthquake insurance products for personal property, businesses operating in the fields of agriculture, industry, and services; (ii) establishing common standards for pricing earthquake insurance; (iii) develop a database of earthquake hazard and probability; (iv) building local earthquake resilience capacity; in which, regulations oblige all insurance and reinsurance companies to approve insurance for particular risks and disasters. (WB, 2011; MAIPARK, 2017).

[1] AIR Designer of the catastrophe model that underpins the insurance policy

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Maipark's premium rates are risk-based (risk-based/actuarial), varying by region (5 areas from low-impact to high-impact) and each asset class (hospitals) commercial, industrial, and residential). The comprehensive insurance can be up to 2.5 million USD for each disaster. The insurance premium rates are detailed in the table below.

Table 3. MAIPARK's Insurance Premium Tariff (Zones I-V) (‰)

Commercial and Industrial (Non-Dwelling House)						
Construction Class		Zone I	Zone II	Zone III	Zone IV	Zone V
Steel, Wood, and RC Frame	≤ 9 Stories	0.75	0.76	1.00	1.43	1,90
	> 9 Stories	1.12	1.15	1.22	1.53	2,00
Others		0.80	1.04	1.55	2.46	4.70
Dwelling House						
Construction Class		Zone I	Zone II	Zone III	Zone IV	Zone V
Steel, Wood, and RC Frame		0,76	0.79	1.04	1.35	1.60
Others		0.80	1.00	1.55	2.24	4.50

Resoucre: Maipark, 2017

a. Financial sources for insurance implementation

Financing for climate risk insurance in Indonesia depends on a commonwealth fund formed from the contribution of assets as shares by various insurance institutions under the government's coordination, which means organizations share risks with each other through the risk-sharing mechanism between the State and the private insurance sector. This mechanism was established by establishing an earthquake risk insurance fund from the insurance company PT Maipark. Accordingly, the company mobilizes capital by allowing domestic insurance and reinsurance companies to own shares at the rate prescribed by the Ministry of Finance.

4. DISCUSSION AND CONCLUSION

Analysis of the experience of developing the digital economy of China, Thailand, and Malaysia shows several features that Vietnam can learn from:

• China

- The establishment of a compensation mechanism is based on economic conditions, geographical characteristics, and the level of development of the insurance market in different localities. Therefore, the insurance coverage and the insured objects are developed flexibly to suit the conditions of each locality.

- Insurance is highly valued by the Chinese Government and deployed in many localities, especially those heavily affected by climate risks.

- Regarding the insurance premium support mechanism, it is implemented on the principle of initiative, voluntary, market-based, responsibility-sharing, step-by-step, and the Government has an important role in leading and contributing to insurance premiums.

- Parties, including Government, households, and businesses, also participate in insurance. If the subjects cannot afford or do not know about insurance, they will receive support from the State.

- With the financial source, the implementation is based on the reserve fund due to the surplus of insurance premiums and contributions from the local government as well as other individuals depending on each locality's economic conditions and implementation situation.

• Philippines

- Crop insurance services should be deployed centrally on several high-value commercial crops. After good development, insurance in other related subjects is taken into account.

- The parties involved in the crop and livestock insurance service participating in the risk-sharing agreement will divide the profit/loss according to the agreed contribution ratio. In addition, the program also received support from the Government, forming the core factor to combat the collapse of the Philippine agricultural insurance service system.

- Agricultural insurance is compulsory for certain agricultural products; farmers who want to borrow capital from banks, credit institutions, and financial centers in rural areas must participate in the service insurance for that loan. This type is to protect these banks from lousy debt risks.

- Using a third party, the WB, to act as an intermediary reinsurer to help transfer the risks of the localities participating in the insurance program.

- Conduct pilot implementation of insurance for two years and make changes to make the insurance liquidation and loss compensation process faster and more convenient.

• Indonesia

- Premiums are calculated on a risk-based/actuarial basis, varying by area, location, type of construction, frequency, and severity of natural disasters.

- The insurance scheme in Indonesia only provides coverage for a specific type of disaster and secondary risks caused by this risk. This program is implemented through a combination of hazards. The State participates in the insurance program in many different forms and with varying levels, from indirectly through policy setting to directly participating with insurance companies. The guarantor of last resort, lender, originator, principal insurer, and reinsurer establish particular institutions such as the PTMaipark program.

Vietnam's insurance market does not have separate climate risk insurance products. Climate-related risks are commonly deployed by insurers as an extended risk content in property insurance policies (fire and special perils, all-risks insurance. industrial insurance, all-risks insurance, etc.), human insurance or agricultural insurance (crops, livestock) or fisheries insurance (fishing vessels, fishing equipment, fishing gear, crewmen) or implemented and integrated into insurance products guided and supported by the State.

These products cover loss of life and property to some extent. However, compared with actual requirements, such coverage does not provide adequate protection for the insured's losses caused by natural disasters. On the other hand, some types of climate risks are now increasingly common and become threats to people's lives, such as flash floods, heavy rains, sea level rise, etc., which are not yet insured under the contracts insurance. Therefore, based on the reality and lessons learned from other countries, some implications for the development of climate risk insurance for Vietnam are given as follows:

Firstly, it is necessary to issue specific regulations guiding Decree 58/2018/ND-CP on agricultural insurance, focusing on supported crops, areas, beneficiaries, and risks. Supported risks and support levels… Besides, it is possible to learn from the experience of the Philippines that it is compulsory to buy insurance for farmers who want to borrow money from financial institutions. Accordingly, localities will have a basis to deploy and encourage agricultural production subjects to participate in insurance.

Second, develop climate risk insurance programs for public assets in localities where risks often occur to reduce the burden of damage compensation from the state budget. The insurance program with public property can use the form of insurance through a combination of risks, a combination of the participation of the Government and the private insurance sector, and the parties cooperating through a mutual agreement approved by the Government. Discussion and agreement between the parties may be based on risk for each area and each asset class.

Third, piloting a parametric insurance program with common types of climate risks in particular localities is advisable. To do this, first of all, Vietnam needs to strengthen cooperation, share information and share experiences with other economies, especially in the Asia-Pacific region - where there is a lot of experience in the financial management of climate risk. At the same time, it is necessary to strengthen coordination with international organizations such as the Worldbank and OECD in completing the legal framework, building a financial strategy on risk management, and developing a database on climate risk.

Fourth, according to China's experience, the Government can build a reserve fund to subsidize and compensate when there is a risk. The reserve fund is formed from the surplus of insurance premiums and contributions from local governments and other individuals, depending on each locality's economic conditions and implementation situation. Suppose a risk occurs and requires compensation and benefits. The Government must decide the risk level based on the Central Committee for Flood and Storm Control proposal, the Center for Meteorology and Hydrology, and the Ministry of Finance. In addition, it is necessary to reallocate the available disaster fund to localities based on risk. Where there are a lot of chances, the fund must be more developed and ready to be disbursed once the severity of the risk has been determined.

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